

CLAIMS

1. A process for controlling the contour of a transition area of a feature made by etching a substrate comprising
applying a patterned resist mask to the substrate to form a plurality of mask openings and mask land areas having mask land areas which are sized and spaced to control the contour of a transition area of the feature wherein the size and spacing of the land areas provide an etch depth in the substrate at the transition area that is less than an etch depth at an adjacent etched or partially etched area of the substrate and etching the substrate to provide a contoured feature at the transition area.
2. The process of claim 1 wherein the width and spacing of mask land areas provide a slower etch rate than an etch rate at an adjacent etched or partially etched area of the substrate.
3. The process of claim 1 wherein the mask land areas are circular, elliptical, square, rectangular, triangular, hexagonal, pentagonal, trapezoidal or a combination of such shapes.
4. The process of claim 1 wherein the patterned resist mask comprises a mesh pattern of mask land areas and mask openings.
5. The process of claim 1 wherein the patterned resist mask comprises mask land areas having at least two distinct shapes or sizes.
6. The process of claim 5 wherein the patterned resist mask comprises transition mask land areas positioned between the at least two distinct shapes or sizes.
7. The process of claim 1 wherein the mask land areas are circles having diameters in the range from about 10 to 100 microns.

8. The process of claim 7 wherein the circular land areas have diameters in the range from about 55 to 70 microns.
9. The process of claim 7 wherein the circular land areas have diameters in the range from about 20 to 30 microns.
10. The process of claim 7 wherein the edges of the circular land areas are spaced at a distance in the range from about 10 to 50 microns.
11. The process of claim 1 wherein the contoured feature comprises a taper, a sharp edge, a corner, a slope or a rounded edge.
12. The process of claim 1 further comprising etching the substrate prior to applying the patterned resist mask to the substrate.
13. A process for controlling a cross section or topography of a transition area of an etched feature in a substrate comprising
applying a resist mask to portions of the substrate to form one or more masked openings and a plurality of masked land areas, wherein one or more of the size, shape, and spacing of the land areas are selected to control a contour of the transition area of the etched feature.
14. The process of claim 13 wherein the transition area comprises a fillet radius.
15. The process of claim 13 wherein the transition area comprises a corner.
16. The process of claim 13 wherein the transition area comprises a slope.
17. The process of claim 13 wherein the transition area comprises a rounded or sharp edge.

18. The process of claim 13 wherein the transition area comprises a taper.
19. A single step partial etching process to provide a feature on a substrate comprising the steps of
- applying a resist mask to selected portions of the substrate, and
 - patterning a mask area of a predetermined planar size and shape at a transition area of the substrate to form one or more mask open areas and one or more mask land areas, wherein the size, shape, and spacing of the one or more mask land areas and the size, shape, and spacing of the one or more mask open areas reduce corner rounding of a feature at the transition area.
20. A single step, partial etching process for etching a thin substrate comprising etching a masked substrate having open areas and resist land areas of sizes and spacings selected to reduce the relative etch rate at a transition area of an etched feature.
21. The process of claim 20 wherein the substrate comprises copper, steel, gold, aluminum, constantan, alloys thereof or a polymer.
22. A process for forming a feature on a substrate comprising:
- applying a resist mask to selected portions of the substrate;
 - patterning a first mask area of a first predetermined planar size and planar shape to form a plurality of first mask openings and first mask land features that are dimensioned to provide a first area etch depth.
 - patterning a second mask area of a second predetermined planar size and planar shape to form a plurality of second mask openings and second mask land features dimensioned to provide a second area etch depth, wherein the second area etch depth is reduced relative to the first area etch depth;

patterning at least a third mask area of a third predetermined planar size and planar shape to form a plurality of third mask openings and third mask land features dimensioned to control a contour of a transition area located adjacent to the first and second mask areas; and

etching the substrate such that the substrate corresponding to the second mask area is etched to a lesser depth than the substrate corresponding to the first mask area, and the transition area adjacent to the first and second mask areas comprises a contoured feature.

23. A method of forming a tapered substrate comprising
applying a patterned resist mask to a substrate, the resist mask comprising a plurality of mask openings and mask land areas sized and spaced to provide an incrementally increasing etch rate from a first end of the substrate to a second end of the substrate; and

etching the substrate such that the etch depth incrementally increases from the first end to the second end of the substrate.

24. The method of claim 23 wherein substrate comprises a plurality of zones, each zone including land mask areas having a different mask size than the land mask areas in at least one other zone.

25. The method of claim 24 wherein each zone includes mask openings having a different opening size than the mask openings in at least one other zone.

26. The method of claim 23 wherein the etch depth substantially linearly increases from the first end to the second end of the substrate.

27. The method of claim 23 wherein each zone includes land mask areas having a different shape than the land mask areas in at least one other zone.

28. The method of claim 23 wherein patterned resist mask comprises a square mesh of open areas and land mask areas.
29. The method of claim 23 wherein the patterned resist mask comprises circles, rectangles, squares, lines or combinations thereof.
30. A method of controlling texturing of a surface of a substrate comprising:
applying a patterned resist mask to the substrate to form a plurality of mask openings and mask land areas that are sized and spaced to control the texture of the substrate surface; and
etching the substrate to provide a textured substrate surface.
31. The method of claim 30 wherein the textured substrate surface is smooth or rough.
32. The method of claim 30 wherein the textured substrate surface comprises varying degrees of texture.